

DIVISION OF THE CRUCIAL LIGAMENTS FOR THE RELIEF OF KNEE-JOINT ANKYLOSIS.*

BY L. M^CLANE TIFFANY, M. D.,

Professor of Surgery, University of Maryland.

(Reprint from *Maryland Medical Journal*.)

In common with, I suspect, many other medical practitioners, I have experienced not infrequently, great difficulty in overcoming the deformity and ankylosis remaining after knee-joint inflammation has subsided, and any operative measure which, in proper cases, will lessen this difficulty, is worthy of mention. The procedure named in the title of this paper (division of crucial ligaments), has been made use of by me with great and immediate benefit to my patient, benefit which, in view of the time which has elapsed since the operation, may be confidently expected to be permanent. It is not unusual after that variety of knee-joint inflammation which is denominated white-swelling has subsided, to find the articulation left in a more or less ankylosed condition, and the head of the tibia resting more behind the femoral condyles than normal, while there is present at the same time rotation of the limb below the knee, so that the toes point outward too strongly; the inner condyle of the femur also is over-prominent; from all of which it results that the function of the entire limb as a weight-bearing organ of progression, is seriously impaired. To restore natural shape and usefulness, division of tendons, of extra-articular bands of fascia, of ligaments, forcible extension under anæsthesia of intra-articular bands and adhesions, shampooing, passive motion, etc., are called into requisition and with excellent effect. It is sometimes found however, that the above means fail to bring about the wished-for result, and that notwithstanding our efforts, the joint remains obstinately misshapen, and more or less stiff. The deformity of the knee under consideration, is far more apt to be met with in children than in adults, and after tendons with extra-articular bands have been severed, the question presents itself as to how much power it is proper to exert in order to forcibly rupture any intra-articular adhesions, the doubtful point being whether, the bone itself, the adhesions, or the epiphyseal joining will give way the soonest. It is customary to break up adhesions, and try to restore motion to a knee-joint not only after inflammatory action has subsided, but a long time after it has subsided, when therefore, of necessity, the articular surfaces of the tibia and femur have become pretty well settled in their vicious relations to each

other. This is a condition of affairs to which neighboring soft parts do not fail to accommodate themselves, for it is a well-known fact that ligaments entering into the construction of a joint, will, if the bones are placed in an abnormal position, so adapt themselves to the new attitude, as to firmly hold the bones in their changed relations, just as the ligaments formerly were expected to do in the normal.

There is no good cause why the above line of thought should not apply to both extra and intra-articular ligaments, and fitting the train of reasoning to the knee, it occurred to me sometime since that the crucial ligaments had a good deal to do with the characteristic position which a knee having assumed, retains so sturdily after a severe attack of inflammation, and as both flexion and extension are limited, that division of these two ligaments would not only permit more motion, but also would enable the tibia to glide forward to its proper relation with the femur.

In November last, a case of knee-ankylosis fell into my hands, which I was unwilling to excise owing to the patient's youth, and not being able to straighten without undue violence, I subjected to division of the crucial ligaments.

In deciding whether a distorted knee should be subjected to the above operation, it is necessary first of all, that all inflammation, of, and about the joint, should have long since passed away, otherwise the necessary manipulation may give rise to recurrence of the original trouble, disastrous suppuration, or what not. Furthermore, the patient should be, as a matter of course, in excellent health, with the functions of life well performed. The hamstring muscles, lateral ligament, and any opposing bands of fascia are then to be divided subcutaneously in the usual way. When the tenotomy punctures have healed, extension under anæsthesia is made, and the operator will be able to recognize that the failure of the joint to further straighten, is due to intra-articular bands. The amount of force which can be exerted to straighten the joint must depend upon the surgical acumen of the operator, and no rule in pounds can be laid down; suffice it to say, that a point is reached beyond which the exercise of force will be prejudicial to the patient's welfare, and this point will, of course, be reached earlier in patients with whom the epiphyseal cartilage still persists, than in those whose bones are completely ossified, for of course, an epiphysis might be wrenched off by too strong manipulation. Further forcible extension being inexpedient and the deformity continuing, division of the crucial ligaments is indicated, and may be done as follows: The patient lies on the back, the affected limb is extended steadily, so as to render tense the anterior cru-

* Read before the Baltimore Academy of Medicine January 15th, 1884.

cial ligament; the tenotome is entered to the inner side of the ligamentum patellæ a quarter of an inch above the articular surface of the tibia and carried backwards and outwards, so as to pass between the tibial spine and the external condyle of the femur below the ligament (ant. crucial). The flat of the blade is towards the tibia, the back of the blade towards the ligamentum patellæ and the edge toward the spine after entering the joint. The knife is now to be carried from side to side across the joint, the edge being directed so as to pass over the spine and divide the anterior crucial just above its attachment to the tibia; the posterior crucial will probably also be divided, but as it lies farther from the skin-puncture it is wise to turn the edge of the tenotome without withdrawal, pass it more deeply into the joint and carry it from the internal to the external condyle, retracing the path already travelled. The tenotomy wound is to be treated as usual. Before entering the knife, it is well to draw upwards the skin, that the opening may be valvular, and air less likely to gain admission to the joint. If the operation has been successful the limb can be well extended; the tibia is felt to glide forwards upon the condyles of the femur to the usual situation, the posterior projection of head disappears and the eversion of the foot is lessened. A proper retentive apparatus (gypsum) is to be applied and the tibia held in its new position until all likelihood of inflammation be past, when passive motion, is to be commenced.

Inasmuch as the affected limb, from long continued non-use is usually but illy developed, friction, electricity, etc., can be used with advantage. Certain practical points in the operation described above present themselves and claim attention: one is, the depth to which the knife must be entered before attempting to cut the ligaments. This will, of course, depend upon the size of the knee demanding treatment; the case related hereafter, required that the tenotome be entered $1\frac{1}{4}$ inches. Lately, when practicing the operation upon an adult male subject in the dissecting-room, I found that the cutting-edge of the knife had to be carried $2\frac{1}{2}$ inches below the skin-surface

before the crucial ligaments could be severed; here, of course, the joint was healthy. It is wise, I think, that the tenotome should possess a blade about three inches long, of which not less than one inch should have a cutting-edge, the better to divide both ligaments at one time; a long and slender point is not entirely free from chance of fracture in an ankylosed knee-joint, and it is well to have the end rounded, or chisel-shaped with the corners cut off, furnished however with a good terminal edge.

CASE.—A—W.—; female, æt. 11 years; seen Nov. 12, 1883. She desired to have her leg made useful. At two years of age she had an inflammation of the left knee, after which the joint remained permanently flexed to nearly a right angle, thus rendering walking on the limb impossible. She has always used a crutch. Examination shows leg flexed on thigh as stated, inner condyle of femur very prominent, the toes rotated outwards strongly, and the head of the tibia displaced backwards to a marked degree. The thigh showed a deeply depressed cicatrice, presumptively connected with the former knee disease. Both thigh and leg were less developed than upon the right side, owing perhaps to disuse, perhaps to inflammatory changes in the epiphyseal cartilages. I divided tendons, fascia, etc., and put on a splint until the tenotomy punctures had healed. Extension to a certain point was then possible, but strong resistance was, beyond this, felt, and so it was inferred that the crucial ligaments required cutting. This was then at once done, after which the limb could be straightened, and the tibia head advanced to its proper position upon the femoral condyles. The puncture was covered with a piece of absorbent cotton, the whole limb wrapped in cotton-wadding, and encased in a plaster-splint. No pain or constitutional disturbance ensued. Examination at the end of a week showed the puncture to be healed. At the end of three weeks, passive motion was commenced, and the patient is now gaining both strength and motion. The tibia has not returned to its former position behind the femur, the sole of the foot rests on the floor, and the limb bears weight.



Tiffney (H. Mc L.)